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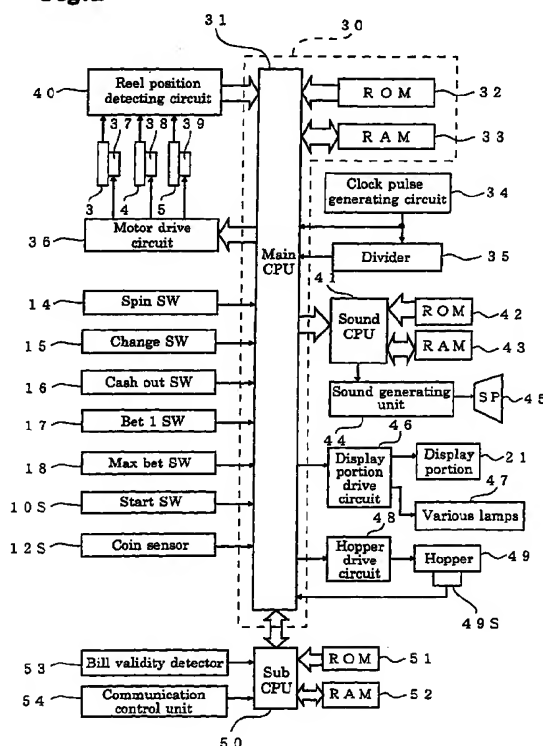
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(54) Game machines having programmable individual characteristics

(57) Conventionally, the same impression is given by electronic game machine bodies of the same kind when any of them is played and attachment or preference of a player with regard to a specific game machine or a game is difficult to produce.

Therefore, a game machine (1) according to the invention is provided with control means for changing control of attached equipment by individual game machines such that individual differences are produced among the game machines of the same kind without changing control of hit probability. For example, when the attached equipment is constituted by reels (3) through (5), ROM (32) stores control constants for determining a timing of starting or stopping rotation of the respective reels (3) through (5) by values which differ depending on the individual game machine. By controlling rotation of the respective reels (3) through (5) by reading the control constants by CPU (31), for example, rotation of the left reel (3) of a certain machine body may be delayed compared with other game machines of the same kind.

Fig.2



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Description

Background of the Invention

Field of the Invention

[0001] The present invention relates to a game machine for executing game processing by controlling a hit probability and controlling attached equipment by a program control using a microcomputer.

Related Art

[0002] Conventionally, as game machines of this kind, there are, for example, flipped ball game machines using flipped balls for game media such as a pachinko machine (pin ball machine), a smart ball game machine and an arrange ball game machine; and slot machines using coins for game media. In recent years, microcomputers have been adopted in such game machines and the game processing of the game machines is now carried out by program control using the microcomputers. A hit in a respective game is produced under a previously programmed probability and attached equipment such as rotary reels are strictly controlled by the program using the microcomputer.

[0003] However, decades ago, such game machines were of a mechanical type and game processing was not dependent on the program control of the microcomputer as in the game machines of recent years. Therefore, even the same kind of mechanical game machines might be different due to an error in fabrication, ageing changes or the wear of mechanical parts. Accordingly, there was a subtle variation in game operation depending on the individual game machine.

[0004] In a game machine having a gambling aspect the operation of the game machine is carried out by a determination derived from a feeling or hunch of the player. The basis for this determination often depends on the compatibility between a player and a specific machine body. In particular, a player tends to select a compatible game machine body in conformity to how the player is feeling on the day. In the mechanical games machines, decades ago, compatibility was determined by the above-described subtle variation provided by each individual game machine.

[0005] In the game machines of recent years in which the machine is controlled by a program, a hit probability is easy to control. However, unlike the mechanical games machines of decades ago, there is almost no difference between individual game machines. Therefore, game machines of the same kind give the same impression when any of them is played, a player does not have an attachment to any specific game machine body.

[0006] Therefore, when the player cannot find a compatible game machine body in a certain kind of game machine then the player obliged to select a game

machine body of another kind of game machine having a different game aspect. As a result, the attachment or preference of the player for a machine or a game is necessarily difficult to give, and therefore the game is devoid of interest.

Summary of the Invention

[0007] The invention has been carried out to address such a problem and according to an aspect of the invention, there is provided a game machine for executing a game processing while controlling a hit probability and controlling an attached equipment by a program control using a microcomputer, wherein the game machine comprises control means for not changing a control of the hit probability and changing a control of the attached equipment in accordance with individuals of the game machines to thereby produce an individual difference among the game machines of a same machine kind.

[0008] By changing control of the attached equipment by the control means of the constitution in accordance with the individuals, the individual difference is produced even with machines of the same machine kind and a delicate variation is produced in game operation by the individual game machine.

[0009] Therefore, the individual difference provided to a game machine of decades ago is produced among the machine bodies and attachment or preference of the player with regard to a machine or a game is newly produced to thereby enhance interest of play.

[0010] Such a control can easily be carried out by setting control constants used in controlling the attached equipment stored to a storage apparatus of the control means by values which differ depending on the individuals, for example.

Brief Description of the Drawings

[0011]

Fig. 1 is a perspective view showing a slot machine according to an embodiment of the invention; Fig. 2 is a block diagram showing a control circuit of the slot machine according to the embodiment; and Fig. 3 is a flowchart showing an outline of play processing of the slot machine according to the embodiment.

Description of the Preferred Embodiment

[0012] An explanation will be given of an embodiment in which a play machine according to the invention is applied to a slot machine as follows.

[0013] Fig. 1 is a perspective view of a slot machine 1 according to the embodiment.

[0014] Three reels 3, 4 and 5 constituting a variable display apparatus are rotatably provided on the rear

side of a reel glass 2 formed on the front face of the slot machine 1. Symbol columns comprising a plurality of kinds of picture patterns (hereinafter, referred to as symbols) are illustrated on outer peripheral faces of the respective reels 3, 4 and 5. Threes of the symbols are observed through each of display windows 6, 7 and 8 on the front face of the slot machine 1. The reels 3, 4 and 5 are started rotating by operating a handle 10 provided on a side face of a cabinet 9.

[0015] Further, a coin entry 12 in which a player puts coins and a bill entry 13 for inserting paper money are provided at a control panel 11 disposed below the reel glass 2. Further, the control panel 11 is provided with a spin switch 14 for starting to rotate the reels 3, 4 and 5 by push button operation separately from operation of the handle 10, and is further provided with a change switch 15, a cash out switch 16, a bet 1 switch 17 and a max bet switch 18.

[0016] Whether coins gained by a player are paid to a coin tray 20 via a coin payment output 19 or are stored inside the machine as credit, is determined by the change switch 15. A number of coins credited to inside of the machine is displayed at a display portion 21 constituted by 7 segment LEDs (Light Emitting Diode). By operating the cash out switch 16, credited coins are paid to the coin tray 20 by push button operation. By operating the bet 1 switch 17, only a single credited coin is bet on the game by one push button operation. By operating the max bet switch 18, the maximum number of credited coins capable of being bet on one game is bet on the game by one push button operation.

[0017] Further, an allotment display table indicating how many coins are paid to hits is displayed on a top glass 22 above the reel glass 2; and a bottom glass 23 below the reel glass 2 is illustrated with characters or the like of the game machine.

[0018] Fig. 2 shows a circuit including a control unit for controlling game processing operation in the slot machine 1 of the embodiment and attached equipment (actuators) electrically connected thereto.

[0019] The control unit includes a microcomputer (hereinafter, referred to as micon) 30 as a principal constituent element. The micon 30 further includes a main CPU 31 executing control operation in accordance with previously set programs, a ROM (Read Only Memory) 32 and a RAM (Random Access Memory; readable and writable memory) 33, which are storage means. The ROM 32 is stored with a control processing procedure of the whole game machine as a program and with control constants used in controlling the attached equipment. The RAM 33 is used as a temporary storage work area when the program is executed.

[0020] Further, the CPU 31 is connected with a clock pulse generating circuit 34 for generating reference clock pulses and a divider 35 both of which are necessary for operating the CPU 31. The divider 35 generates interrupt pulses for interrupting and executing programs.

[0021] The CPU 31 is connected with a start switch 10S and a coin sensor 12S other than the respective switches 14 through 18, mentioned above. The start switch 10S generates a signal for starting the reels 3 through 5 when a player operates the handle 10 and is made ON or OFF in connection with the operation of the handle 10. The coin sensor 12S detects proper coins inputted from the coin entry 12 and selected by a coin selecting apparatus.

[0022] Further, a motor drive circuit 36 connected to the CPU 31 controls respective stepping motors 37, 38 and 39 for driving the reels 3, 4 and 5 and a reel position detecting circuit 40 detects rotational positions of the respective reels 3, 4 and 5 and outputs the detected rotational positions to the CPU 31.

[0023] Further, the CPU 31 is connected with a sound CPU 41 and the sound CPU 41 controls a sound generating unit 44 in accordance with programs and control constants stored in a sound ROM 42 and outputs various game sounds from a speaker 45 as effective sounds. A sound RAM 43 is used as a temporary storage work area in processing to control the sound CPU 41. The sound generating unit 44 and the speaker 45 together constitute a game sound generating apparatus.

[0024] Further, the CPU 31 is connected with a display portion drive circuit 46 and a hopper drive circuit 48. The display portion drive circuit 46 controls lighting of the display portion 21, mentioned above, and various lamps 47. The hopper drive circuit 48 drives a hopper 49 and pays coins contained in the hopper 49 to the coin tray 20. Paid coins are detected by a paid coin sensor 49S and the number of detected coins is given to the CPU 31. The hopper drive circuit 48, the hopper 49 and the paid coin sensor 49S together constitute a game media paying apparatus.

[0025] Further, the CPU 31 is connected with a sub CPU 50 and the sub CPU 50 controls a bill validity detector 53 and a communication control unit 54 in accordance with programs and control constants stored in a ROM 51. A RAM 52 is used as a temporary storage work area in control processings by the CPU 50. The bill validity detector 53 detects paper money inserted into the bill entry 13 and the communication control unit 54 controls communication with a host computer of a game center.

[0026] Next, an explanation will be given of an outline of operation of the play machine controlled by the micon 30 according to the embodiment in reference to a flowchart of Fig. 3 as follows.

[0027] First, the CPU 31 determines whether coin BET is carried out (Fig. 3, step 101). The determination is "YES" when coins are put into the coin entry 12 and a detected signal is inputted from the coin sensor 12S or when a signal is inputted from the bet 1 switch 17 or the max bet switch 18. In that case, successively, the operation determines whether a start signal is inputted from the start switch 10S or the spin switch 14 (step 102).

[0028] When the determination is "YES", the CPU 31 drives the reels 3 through 5 to rotate by transmitting a drive signal to the motor drive circuit 36 (step 103). The CPU 31 then executes random number sampling (step 104). The random number sampling is executed by storing to the RAM 33, a numerical value produced by adding a predetermined number (for example, 3) to one integer in a predetermined range (for example, 0 through 127) generated from an R resistor in the CPU 31 each time a reference clock pulse is input from the clock pulse generating circuit 34 and then reading the numerical value stored in the RAM 33 each time the operation is executed by an interrupt.

[0029] Next, the operation executes hit determination (step 105) based on the random number value sampled as described above. The hit determination is executed by comparing a hit probability table previously stored in the ROM 32 with the sampled random number value and a flag in accordance with a result of the hit determination (for example, indicating hit or miss) is set in the RAM 33. Further, the operation determines whether a result of the hit determination at current time is a big hit (step 106). In the case of "YES", the operation executes a big hit game routine (step 107). In the case of "NO", the operation executes a normal game routine (step 108). Although a player can generally gain a large number of coins in a big hit game, the number of gained coins is small in a normal game.

[0030] In this way, there is carried out the control of hit probability in the random sampling at step 104 and the hit determination at step 105 and the total coin payment rate in, for example, business hours of a day is maintained substantially constant. However, the slot machine 1 according to the embodiment is provided with control means for individually changing control of the attached equipment to produce individual differences among game machines of the same kind without changing such the control of the hit probability.

[0031] The control means is constituted by the main CPU 31 having the ROM 32 and the RAM 33, the sound CPU 41 having the sound ROM 42 and the sound RAM 43 and the sub CPU 50 having the ROM 51 and the RAM 52. Control constants stored in the respective ROMs 32, 42 and 51, and used for controlling the respective attached equipment, are set to values which differ according to the individual game machine. Thus, a difference is produced among game machines of the same kind by controlling the respective attached equipment using the different control constants in the respective CPUs 31, 41 and 50.

[0032] For example, when the attached equipment is constituted by the reels 3 through 5 for variably displaying various symbols, the ROM 32 stores control constants for determining the timings for starting or stopping rotation of the respective reels 3 through 5, the values of which constants differ according to the individual game machine. By controlling the respective reels 3 through 5 to rotate by reading the control constants by

the CPU 31, for example, the left reel 3 of a certain game machine body may start rotating later than the left reel 3 of another game machine body even though the two machine bodies are game machines of the same kind. Alternatively, the central reel 4 of a certain machine body may stop rotating later e.g. the reel 4 may stop rotating after the reel 4 has rotated further by one rotation after the other two reels 3, 5 have stopped.

[0033] Further, when the attached equipment is constituted by the switches 14 through 18 for controlling operation of the game machine, the RAM 32 stores control constants for determining operational timings in response to operation of the respective switches 14 through 18 the values of which differ according to the individual game machine. The CPU 31 reads the control constants and executes operational control in correspondence with operation of the respective switches 14 through 18 and changes response timings with regard to respective switching operations depending on the individual game machine.

[0034] For example, when the bet 1 switch 17 is operated, with regard to a certain machine body, a lamp having a built-in switch is not immediately lighted but the lamp is delayed to light by one beat. Further, the amount of credit displayed on the display portion 21 is also delayed to decrease by one beat. Alternatively, with regard to a certain game machine body, even when the spin switch 14 is operated, the reels 3 through 5 are not rotated immediately but are delayed to start rotating. Further, with regard to a certain game machine body, even when the cash out switch 16 is operated, payment is not carried out immediately but the payment is delayed.

[0035] Further, when the attached equipment is the game media paying apparatus, the ROM 32 is stored with control constants for determining a speed of paying coins or a timing of paying thereof from the hopper 49 by the hopper drive circuit 48, the values of which differ depending on the individual game machine. The CPU 31 reads the control constants, executes a control of paying coins by the hopper drive circuit 48 and changes the speed of paying coins paid to the coin tray 20 or the timing of paying thereof in accordance with the control constants. For example, with regard to a certain game machine body, the paying speed is extremely delayed or with regard to a certain game machine body, the payment is temporarily stopped and the payment is executed again after a while even when the game machine bodies are of the same kind.

[0036] Further, when the attached equipment is the game sound generating apparatus, the sound ROM 42 stores control constants for determining a sound emitting rate or a sound emitting timing of the game sound generating apparatus, the values of which differ depending on the individual game machine. The sound CPU 41 reads the control constants and executes a control to emit sound from the speaker 45 by the sound generating unit 44 and changes the sound emitting rate

or the sound emitting timing depending on the individual game machine. For example, with regard to a certain game machine body, a sound on rotating the reels 3 through 5 is emitted while being delayed from a timing of starting to rotate the reels 3 through 5; or only with regard to a certain game machine body, the sound on rotating the reels is stopped earlier than a timing of stopping the reels 3 through 5. Further, even when a hit is produced by arranging a predetermined combination of symbols on an effected hit line, with regard to a certain game machine body, the effective sound of hit is not emitted immediately but the effective sound of a hit is emitted while being delayed by one beat or the effective sound of a hit is emitted at an unhurried speed.

[0037] Such individual differences are similar to the individual differences produced by a production error the mechanical game machines of decades ago. In the present invention, a mechanical control error is programmed intentionally and is written to a base program (OS) of one ROM as a variation. Further, several kinds of variations may be written to one base program by combining kinds of the respective differences, mentioned above. However, as mentioned above, the program has nothing to do with the hit probability of game and a game machine of the same kind is always provided with the same hit probability. The game machines of the same kind are also provided with the same appearance. Therefore, a player cannot discriminate the variation from the appearance.

[0038] By preparing, for example, 10 kinds of ROMs having such variations and mixing them into respective game machine bodies of a group of 100 game machines either uniformly or randomly, there can be provided variations which differ between game machine bodies of the same kind, even within the group. Therefore, a player can find and play with game machine bodies from the group having different compatibilities. The player can therefore play a game machine having the compatible game aspects preferred by the player and accordingly, when a game machine is not satisfactory to the player, the player may change the game machine and when a game machine selected by the player has a variation that is satisfactory to the player, the player can stick thereto.

[0039] Therefore, the player can play a game machine for a long period of time without losing interest. Accordingly, the operational rate of the game machine is promoted and general coin-in, that is the sales of the game center, can be increased. Further, the player is less likely to move to a game machine of other game machine maker and accordingly, the player regularly plays on the game machine of one maker. As a result, the brand value of the company which makes the game machine is also promoted.

[0040] According to the above-described embodiment, an explanation has been given of the case in which the invention is applied to the slot machine. However, the invention is similarly applicable to flipped game

machines such as a pachinko machine, a smart ball game machine and an arrange ball game machine which are program-controlled. Also in such cases, an effect similar to that in the above-described embodiment is achieved.

Claims

1. A game machine (1) having a hit probability, the game machine comprising:

attached equipment (3-5,14-18,44,45,48,49); and
control means (31-33,41-43,50-52) for controlling the hit probability and the attached equipment (3-5,14-18,44,45,48,49) by means of a predetermined control program;
CHARACTERIZED IN THAT the control means (31-33,41-43,50-52) can change one or more parameters of the predetermined control program, thereby changing the control of the attached equipment (3-5,14-18,44,45,48,49) to give the game machine (1) an individual characteristic whilst not changing the hit probability.

2. A game machine (1) according to claim 1, wherein the control means includes storage means (32,42,51) for storing control constants which are used to change one or more parameters of the predetermined control program and thereby change the control of the attached equipment (3-5,14-18,44,45,48,49) in accordance with the control constants.

3. A game machine (1) according to claim 2, wherein the attached equipment is a variable display apparatus (3-5) for variably displaying various picture patterns, the storage apparatus (32) stores the control constants for determining a timing of starting a variable display or stopping a variable display of the variable display apparatus (3-5), and the control means (31-33) controls the variable display of the variable display apparatus (3-5) by changing the timing parameters of the predetermined control program for starting and stopping the variable display apparatus (3-5) in accordance with the control constants.

4. A game machine (1) according to claim 2 or claim 3, wherein the attached equipment is a switch (14-18) for controlling the operation of the game machine (1), the storage apparatus (32) stores the control constants for determining a operational timing in response to operating the switch (14-18), and the control means (31-33) controls the operational timing of the switch (14-18) by changing the operational timing parameters of the predetermined control program for the reaction timing in response

to operating the switch (14-18) in accordance with the control constants.

5. A game machine (1) according to any of claims 2 to 4, wherein the attached equipment is an apparatus (48,49) for paying game media, the storage apparatus (32) stores the control constants for determining the speed of paying or a timing of paying of the apparatus (48,49) for paying game media, and the control means (31-33) controls the speed of paying or the timing of paying of the apparatus (48,49) for paying game media by changing the speed and timing parameters of the predetermined control program for the apparatus (48,49) for paying game media in accordance with the control constants.
6. A game machine (1) according to any of claims 2 to 5, wherein the attached equipment is an apparatus (44,45) for generating a game sound, the storage apparatus (42) stores the control constants for determining the sound emitting rate or the sound emitting timing of the apparatus (44,45) for generating a game sound, and the control means (41-43) controls the sound emitting rate or the sound emitting timing parameters of the predetermined control program for the apparatus (44,45) for generating a game sound in accordance with the control constants.
7. A game machine (1) according to any preceding claim, wherein the game machine is a slot machine (1) or a flipped ball game machine.
8. A method of giving a game machine (1) having a hit probability and attached equipment (3-5,14-18,44,45,48,49) an individual characteristic, the method comprising the steps of:
 - using control means (31-33,41-43,50-52) to control the hit probability and the attached equipment (3-5,14-18,44,45,48,49) by means of a predetermined control program; and
 - CHARACTERIZED BY the control means (31-33,41-43,50-52) changing one or more parameters of the predetermined control program, and thereby changing the control of the attached equipment (3-5,14-18,44,45,48,49) to give the game machine (1) an individual characteristic whilst not changing the hit probability.

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Fig.1

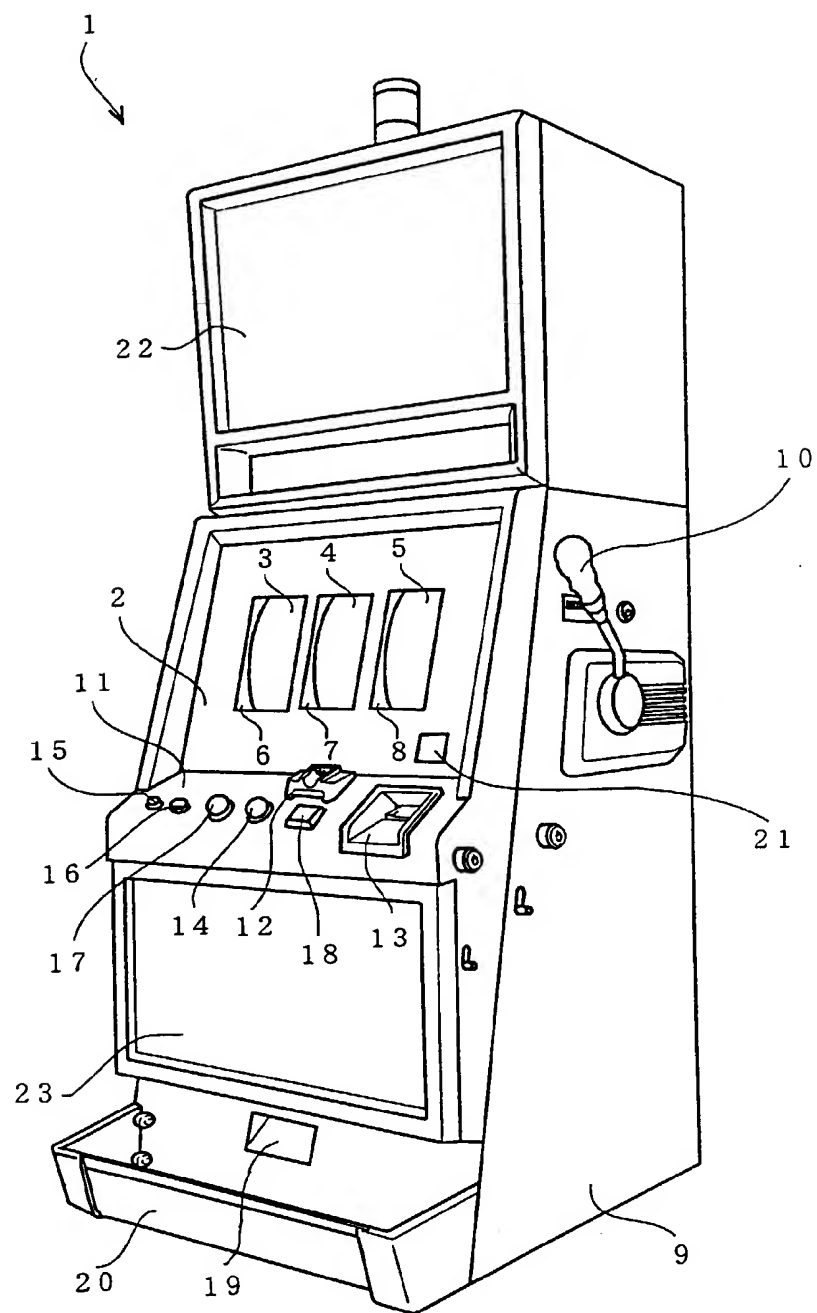


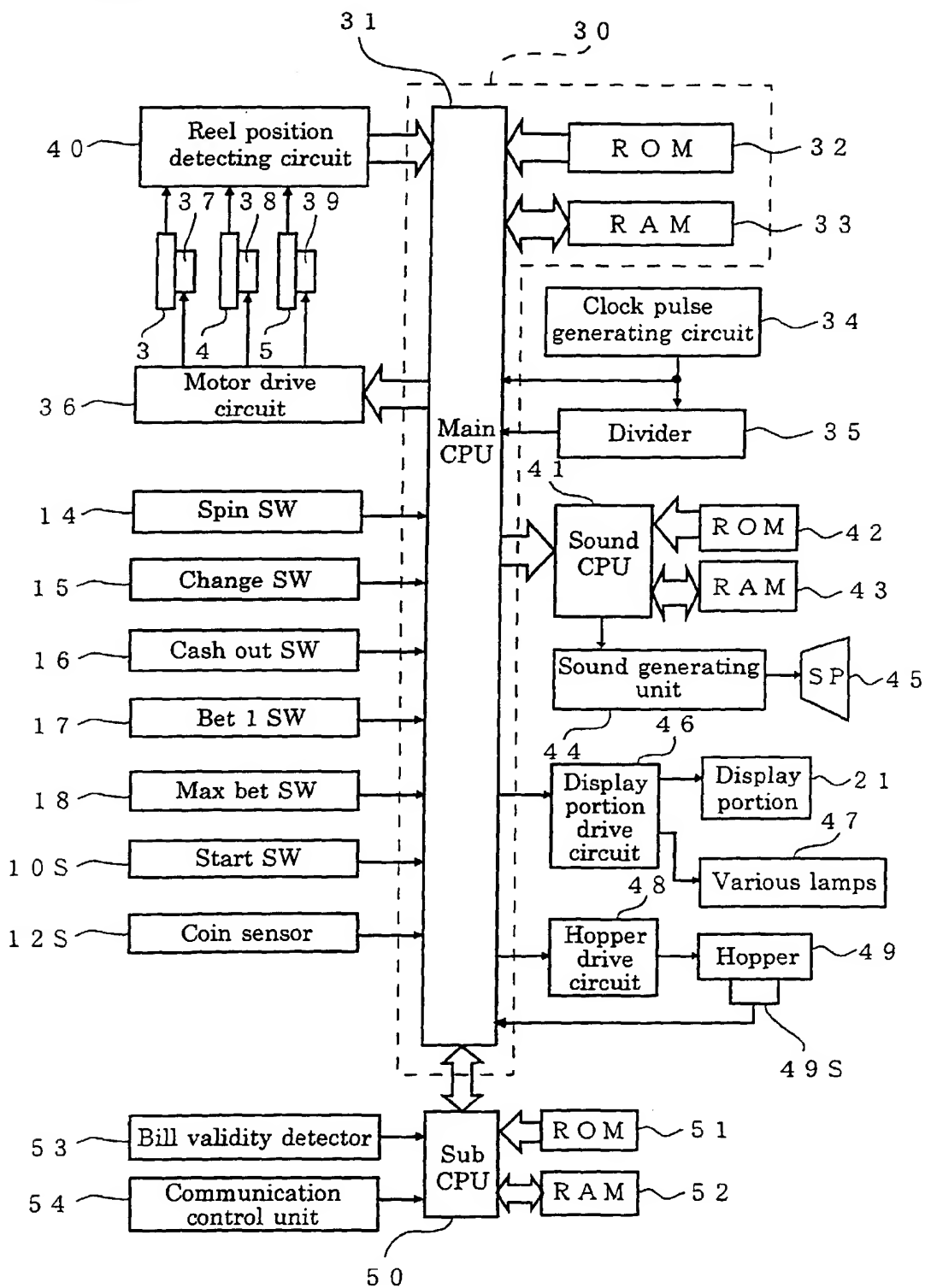
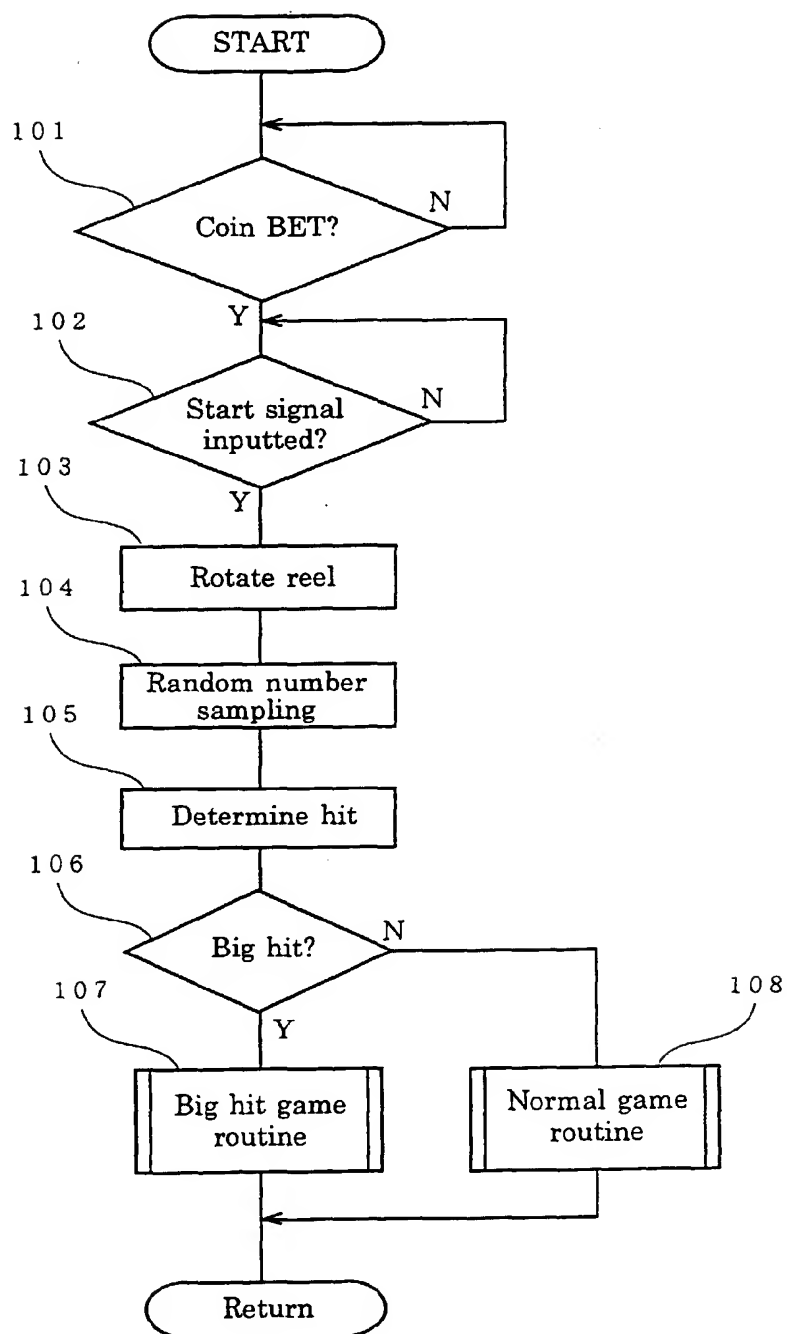
Fig.2

Fig.3



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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 2383

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 472 197 A (GWIASDA BILL ET AL) 5 December 1995 (1995-12-05)	1-4,6-8	G07F17/32
A	* column 1, line 24 - line 48 * * column 2, line 43 - column 3, line 34 * * abstract; figures 3,4 *	5	
A	DE 196 25 293 A (BALLY WULFF AUTOMATEN GMBH) 2 January 1998 (1998-01-02) * abstract; claims 1,3,4,6; figure 2 *	1,8	
A	GB 2 091 014 A (AFM ELECTRONICS LTD) 21 July 1982 (1982-07-21) * page 1, line 98 - page 2, line 1 * * abstract; claim 1 *	1,8	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			G07F
Place of search THE HAGUE		Date of completion of the search 26 June 2000	Examiner Reule, D
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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26-06-2000

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